

Solenoid valve

The invention relates to a solenoid valve having a clapper armature according to the preamble of claim 1.

Solenoid valves are used for control systems of all types and generally comprise a valve housing, an electromagnet, which has a coil, a yoke and an armature, and at least one valve seat and a sealing element which can be actuated by the armature and which co-operates with the valve seat. A particular distinction is drawn between the principle of plunger-type armatures and clapper-type armatures in the configuration of the electromagnet, in particular with regard to the armature.

In order to be able to ensure reliable operation of magnetic valves with power consumption which is as low as possible, fine tolerances must be complied with or compensated for when the individual elements are manufactured and when the solenoid valve is assembled.

There is the additional desire in the field of pneumatics to have smaller and smaller valves. The result in small solenoid valves, even with very fine tolerances, is that a reliable function cannot always be ensured with low power levels and small stroke actions owing to the sum of the individual tolerances.

Therefore, the problem addressed by the invention is further to develop the solenoid valve according to the preamble of claim 1 so that a reliable function can likewise be ensured with small solenoid valves.

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permanently onto the yoke pin 3.1 so that the magnetic contact resistance is kept at a low level.

The spring 7 is supported on a ball 8 which is pressed into the valve housing 1.

The valve housing 1 is preferably formed in one piece. In the embodiment illustrated, the coil 2 is further wound directly onto the valve housing. The coil 2 is surrounded externally by a protective sheath 9.

The clapper armature 4 is in the form of a flat element which is slightly bent over in the region of the yoke pin 3.2 in the embodiment illustrated.

The embodiment illustrated is a 3/2-way solenoid valve having a pressure connection 10, a working connection 11 and a discharge connection 12. Furthermore, a second valve seat 13 is provided in addition to the first valve seat 5, the sealing element 6 being arranged between the two valve seats in a recess 4.2 of the clapper armature 4. The working connection 11 is connected, depending on the position of the sealing element 6, to the pressure connection 10 via the first valve seat 5 or to the discharge connection 12 via the second valve seat 13.

A first resilient element 14 is provided in the region of the end 4.3 of the clapper armature 4 that is opposite the bearing and acts by means of the end 4.2 of the clapper armature on the sealing element 6 for the purpose of a closure of the first valve seat 5 by the sealing element 6. In the closed position (not illustrated) of the first valve seat 5, the clapper armature 4 is lifted away from the yoke pin 3.2. Furthermore, a second resilient element 15 is



the clapper armature alone. In that position, however, the working air gap would inevitably be smallest and, consequently, the force of the clapper armature greatest in the region of the sealing element. That would mean that the valve would have to be adjusted extremely precisely in order to prevent either leaks or an excessively large pressure from the sealing element on the second valve seat. In the embodiment illustrated, the closing force of the sealing element on the second valve seat 13 is effected only by the force of the second resilient element 15 since the clapper armature 4 still "hinges inwards" slightly further after the sealing element 6 has come into closing contact with the second valve seat 13. The sealing element 6 is, therefore, also arranged only loosely in the recess 4.2 of the clapper armature 4 for that purpose.

In an arrangement of that type, the sealing element is held by resilient force both in the closed position with the first valve seat and in the closed position with the second valve seat. In that manner, a very reliable operation is ensured without having to comply with excessively fine tolerances.

Therefore, the above-described solenoid valve is also particularly suitable for very small valves.

In order to be able to carry out switching with as little power as possible precisely in very small solenoid valves, it is necessary to comply with fine tolerances. In order to simplify the production and assembly in that respect, not only the yoke pins are pressed into the valve housing, but also the two valve seats, the relative location of the valve seats to each other and to the clapper armature being adjustable by pressing in the valve seats. To that end, the

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valve seats have an outer surrounding projection which is sealingly pressed into the valve housing when the valve seat is pressed in. In that manner, an extremely compact solenoid valve is obtained and it is possible to dispense with additional seals.

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